

Summary of Claimed Subject Matter

There are two independent claims. Each is discussed below.

Independent claim 29 is directed to a method of inserting an artificial implant into a disc space between two adjacent vertebral bodies (Specification, page 1, lines 3-5 and page 10, lines 6-7; see, e.g., Fig 6C). The method includes providing an artificial implant (100) having an upper surface (106) and a lower surface (108) (Specification, page 13, lines 20-23; see, e.g., Fig. 7B). The implant has a lateral side and an opposite medial side and a maximum width therebetween (e.g., Fig. 7A). The upper and lower surfaces of the implant are arcuate from the lateral side to the medial side along the maximum width of said implant and in a plane transverse to a mid-longitudinal axis of the implant (Specification, page 13, lines 20-23; see, e.g., Figs. 7A and 7B). The implant has generally non-linear leading (102) and trailing (104) ends (Specification, page 13, lines 15-18; see, e.g., Figs. 6C and 7A). The mid-longitudinal axis of the implant, being perpendicular to and bisecting the maximum width into two equal parts, passes through the leading and trailing ends (Specification, page 16, line 19; see, e.g., Figs. 7A, 7B, and 10). The trailing end of the implant is configured to generally conform to at least a portion of the natural anatomical curvature of at least one of the anterior, posterior, and lateral aspects of the vertebral bodies (Specification, page 13, lines 15-18; see, e.g., Fig. 6C). The implant has a length between the leading and trailing ends adapted to allow at least a portion of the implant proximate the leading end and at least a portion of the implant proximate the trailing end to each overlie respective portions of a peripheral rim of the densely compacted bone of the apophyseal rim along the anatomical curvature of the adjacent vertebral bodies when the implant is implanted in the disc space (Specification, page 15, lines 4-10; see, e.g., Fig. 6C).

The method further includes forming an opening across a height of the disc space and into a portion of each of the adjacent vertebral bodies, the opening in the portion of each of the adjacent vertebral bodies being at least in part curved (Specification, page 1, lines 3-8; see, e.g., Figs. 4 and 8).

The method further includes inserting, after the forming of the opening, the

implant into the opening with the lateral side of the implant facing one of the anterior and lateral aspects of the vertebral bodies (e.g., Fig. 6B).

The method further includes positioning the leading end of the implant so that at least a portion of the implant proximate the leading end between the medial side and the mid-longitudinal axis overlies the apophyseal rim without substantially protruding from the spine (Specification, page 15, lines 3-5; see, e.g., Fig. 6C).

The method further includes positioning the trailing end of the implant so that at least a portion of the implant proximate the trailing end between the medial side and the mid-longitudinal axis overlies the apophyseal rim when said at least a portion of the implant proximate the leading end overlies the apophyseal rim without substantially protruding from the spine (Specification, page 9, lines 5-12; see, e.g., Fig. 6C).

Independent claim 39 is directed to a method of inserting a pair of artificial implants into a disc space between two adjacent vertebral bodies (Specification, page 1, lines 3-5; page 10, lines 6-7; and p. 15, lines 3-4; see, e.g., Fig 6C). The method includes providing a first artificial implant (100) having generally non-linear leading (102) and trailing (104) ends (Specification, page 13, lines 15-18; see, e.g., Fig. 7A). The trailing end of the implant is configured to generally conform to at least a portion of the natural anatomical curvature of at least one of the anterior, posterior, and lateral aspects of the vertebral bodies (Specification, page 13, lines 15-18; see, e.g., Fig. 6C). The first implant has a lateral side and an opposite medial side and a maximum width therebetween less than one half of the width of the disc space (e.g., Fig. 6C). The implant has a mid-longitudinal perpendicular to and bisecting the maximum width into two equal parts, which passes through the leading and trailing ends (Specification, page 16, line 19; see, e.g., 7A and 7B). The implant has a length between the leading and trailing ends adapted to allow at least a portion of the implant proximate the leading end and at least a portion of the implant proximate the trailing end to each overlie a peripheral rim of the densely compacted bone of the apophyseal rim along the anatomical curvature of the adjacent vertebral bodies when the first implant is

implanted in the disc space (Specification, page 15, lines 4-10; see, e.g., Fig. 6C). Each of the lateral and medial sides of the first implant are at least in part straight in a direction from the leading end to the trailing end along at least a portion of the length of the first implant (e.g., Figs. 7A and 6C).

The method further includes providing a second artificial implant (100) having generally non-linear leading (102) and trailing (104) ends being configured to generally conform to at least a portion of the natural anatomical curvature of at least one of the anterior, posterior, and lateral aspects of the vertebral bodies (Specification, page 13, lines 15-18; see, e.g., Fig. 6C). The second implant has a lateral side and an opposite medial side and a maximum width therebetween less than one half of the width of the disc space (e.g., Fig. 6C). The second implant has a mid-longitudinal axis perpendicular to and bisecting the maximum width into two equal parts, which passes through the leading and trailing ends (Specification, page 16, line 19; see, e.g., Fig. 6C). The second implant has a length between the leading and trailing ends adapted to allow at least a portion of the implant proximate the leading end and at least a portion of the implant proximate the trailing end to each overlie the peripheral rim of the densely compacted bone of the apophyseal rim along the anatomical curvature of the adjacent vertebral bodies when the second implant is implanted in the disc space (Specification, page 15, lines 4-10; see, e.g., Fig. 6C). Each of the lateral and medial sides of the second implant are at least in part straight in a direction from the leading end to the trailing end along at least a portion of the length of the second implant (e.g., Fig. 6C).

The method further includes forming at least one opening across a height of the disc space and into a portion of each of the adjacent vertebral bodies, the at least one opening in the portion of each of the adjacent vertebral bodies being at least in part curved (Specification, page 1, lines 3-8; see, e.g., Figs. 4 and 8).

The method further includes inserting, after the forming of the at least one opening, the first implant into the at least one opening with the lateral side facing one of the anterior and lateral aspects of the vertebral bodies (e.g., Fig. 6C).

The method further includes inserting, after the forming of the at least one opening, the second implant into the at least one opening with the lateral side of the

second implant facing one of the anterior and lateral aspects of the vertebral bodies (e.g., Fig. 6C).

The method further includes positioning the leading end of each implant so that at least a portion of the implant proximate the leading end between the medial side and the mid-longitudinal axis overlies the apophyseal rim without substantially protruding from the spine (Specification, page 15, lines 3-5; see, e.g., Fig. 6C).

The method further includes positioning the trailing end of each implant so that at least a portion of the implant proximate the trailing end between the medial side and the mid-longitudinal axis overlies the apophyseal rim when the at least a portion of the implant proximate the leading end overlies the apophyseal rim without substantially protruding from the spine (Specification, page 9, lines 5-12; see, e.g., Fig. 6C).

CLAIMS APPENDIX

Claims 1-28 (cancelled).

29. A method of inserting an artificial implant into a disc space between two adjacent vertebral bodies, the method comprising:
- providing an artificial implant having an upper surface and a lower surface, the implant having a lateral side and an opposite medial side and a maximum width therebetween, the upper and lower surfaces being arcuate from the lateral side to the medial side along the maximum width of said implant and in a plane transverse to a mid-longitudinal axis of the implant, the implant having generally non-linear leading and trailing ends, the mid-longitudinal axis of the implant passing through said leading and trailing ends, the mid-longitudinal axis being perpendicular to and bisecting the maximum width into two equal parts, the trailing end being configured to generally conform to at least a portion of the natural anatomical curvature of at least one of the anterior, posterior, and lateral aspects of the vertebral bodies, the implant having a length between the leading and trailing ends adapted to allow at least a portion of the implant proximate the leading end and at least a portion of the implant proximate the trailing end to each overlie respective portions of a peripheral rim of the densely compacted bone of the apophyseal rim along the anatomical curvature of the adjacent vertebral bodies when the implant is implanted in the disc space;

forming an opening across a height of the disc space and into a portion of each of the adjacent vertebral bodies, the opening in the portion of each of the adjacent vertebral bodies being at least in part curved;

inserting, after the forming of the opening, the implant into the opening with the lateral side of the implant facing one of the anterior and lateral aspects of the vertebral bodies;

positioning the leading end of the implant so that at least a portion of the implant proximate the leading end between the medial side and the mid-longitudinal axis overlies the apophyseal rim without substantially protruding from the spine; and

positioning the trailing end of the implant so that at least a portion of the implant proximate the trailing end between the medial side and the mid-longitudinal axis overlies the apophyseal rim when said at least a portion of the implant proximate the leading end overlies the apophyseal rim without substantially protruding from the spine.

30. The method of claim 29, further comprising attaching a driver instrument to the implant to insert the implant into the opening formed during the step of forming.
31. The method of claim 29, wherein the implant is a fusion implant having a hollow therein, further comprising loading the implant with a fusion promoting material prior to inserting the implant.

32. The method of claim 31, wherein the fusion promoting material includes at least one of bone, coral, bone morphogenetic protein, and genes coding for the production of bone.
33. The method of claim 29, further comprising combining the implant with a fusion promoting material.
34. The method of claim 33, wherein the fusion promoting material includes at least one of bone, coral, bone morphogenetic protein, and genes coding for the production of bone.
35. The method of claim 29, wherein the forming of the opening includes drilling the opening.
36. The method of claim 29, wherein the inserting of the implant includes linearly inserting the implant into the opening.
37. The method of claim 29, wherein the inserting of the implant includes rotating the implant at least one half turn into the opening.
38. The method of claim 29, wherein the inserting of the implant includes screwing the implant into the opening.
39. A method of inserting a pair of artificial implants into a disc space between two adjacent vertebral bodies, the method comprising:
 - providing a first artificial implant having generally non-linear leading and trailing ends, the trailing end being configured to generally conform to at least a portion of the natural anatomical curvature of at least one of the anterior, posterior, and lateral aspects of the vertebral bodies, the first implant having a lateral side and an opposite medial side and a maximum

width therebetween less than one half of the width of the disc space, the implant having a mid-longitudinal axis passing through said leading and trailing ends, the mid-longitudinal axis being perpendicular to and bisecting the maximum width into two equal parts, and a length between the leading and trailing ends adapted to allow at least a portion of the implant proximate the leading end and at least a portion of the implant proximate the trailing end to each overlie a peripheral rim of the densely compacted bone of the apophyseal rim along the anatomical curvature of the adjacent vertebral bodies when the first implant is implanted in the disc space, each of the lateral and medial sides being at least in part straight in a direction from the leading end to the trailing end along at least a portion of the length of the first implant;

providing a second artificial implant having generally non-linear leading and trailing ends being configured to generally conform to at least a portion of the natural anatomical curvature of at least one of the anterior, posterior, and lateral aspects of the vertebral bodies, the second implant having a lateral side and an opposite medial side and a maximum width therebetween less than one half of the width of the disc space, the implant having a mid-longitudinal axis passing through said leading and trailing ends, the mid-longitudinal axis being perpendicular to and bisecting the maximum width into two equal parts, and a length between the leading and trailing ends adapted to allow at least a portion of the implant proximate the leading end and at least a portion of the implant proximate

the trailing end to each overlies the peripheral rim of the densely compacted bone of the apophyseal rim along the anatomical curvature of the adjacent vertebral bodies when the second implant is implanted in the disc space, each of the lateral and medial sides being at least in part straight in a direction from the leading end to the trailing end along at least a portion of the length of the second implant;

forming at least one opening across a height of the disc space and into a portion of each of the adjacent vertebral bodies, the at least one opening in the portion of each of the adjacent vertebral bodies being at least in part curved;

inserting, after the forming of the at least one opening, the first implant into the at least one opening with the lateral side facing one of the anterior and lateral aspects of the vertebral bodies;

inserting, after the forming of the at least one opening, the second implant into the at least one opening with the lateral side of the second implant facing one of the anterior and lateral aspects of the vertebral bodies;

positioning the leading end of each implant so that at least a portion of the implant proximate the leading end between the medial side and the mid-longitudinal axis overlies the apophyseal rim without substantially protruding from the spine; and

positioning the trailing end of each implant so that at least a portion of the implant proximate the trailing end between the medial side and the

mid-longitudinal axis overlies the apophyseal rim when the at least a portion of the implant proximate the leading end overlies the apophyseal rim without substantially protruding from the spine.

40. The method of claim 39, wherein the providing of at least one of the implants includes providing an implant with an asymmetrical trailing end.
41. The method of claim 29, wherein the providing of the implant includes providing an implant with a symmetrical trailing end.
42. The method of claim 39, wherein each implant is a fusion implant having a hollow therein, further comprising loading each implant with fusion promoting material prior to inserting each implant.
43. The method of claim 42, wherein the fusion promoting material includes at least one of bone, coral, bone morphogenetic protein, and genes coding for the production of bone.
44. The method of claim 39, further comprising combining at least one of the implants with a fusion promoting material.
45. The method of claim 44, wherein the fusion promoting material includes at least one of bone, coral, bone morphogenetic protein, and genes coding for the production of bone.
46. The method of claim 39, wherein the forming of the opening includes drilling the at least one opening.
47. The method of claim 39, wherein each insertion includes linearly inserting the implant into the at least one opening.

48. The method of claim 39, wherein each insertion includes rotating the implant at least one half turn into the at least one opening.
49. The method of claim 39, wherein each insertion includes screwing the implant into the at least one opening.
50. The method of claim 29, wherein the positioning of the implant includes positioning a majority of the trailing end of the implant along the apophyseal rim of at least one of the adjacent vertebral bodies.
51. The method of claim 29, wherein the providing of the implant includes providing the trailing end of the implant with a curved portion generally corresponding to the natural curvature of at least one of the anterior and lateral aspects of the vertebral bodies.
52. The method of claim 39, wherein the positioning of each implant includes positioning a majority of the trailing end of each implant along the apophyseal rim of at least one of the adjacent vertebral bodies.
53. The method of claim 39, wherein the providing of at least one of the implants includes providing the trailing end of at least one of the implants with a curved portion generally corresponding to the natural curvature of at least one of the anterior and lateral aspects of the vertebral bodies.
54. The method of claim 29, wherein the positioning of the implant includes positioning the entire trailing end of the implant on the peripheral rim of the densely compacted bone along the anatomical curvature of the adjacent vertebral bodies.

- 55. The method of claim 39, wherein the positioning of each implant includes positioning the entire trailing end of each implant on the peripheral rim of the densely compacted bone along the anatomical curvature of the adjacent vertebral bodies.
- 56. The method of claim 29, wherein the positioning of the implant includes positioning at least a portion of the trailing end of the implant between the medial side and the mid-longitudinal axis of the implant on at least one of the anterior cortex and apophyseal rim of the adjacent vertebral bodies.
- 57. The method of claim 39, wherein the positioning of each implant includes positioning at least a portion of the trailing end of each implant between the medial side and the mid-longitudinal axis of the implant on at least one of the anterior cortex and apophyseal rim of the adjacent vertebral bodies.
- 58. The method of claim 29, wherein the providing of the implant includes providing the implant with a first maximum length measured along the medial side that is longer than a second maximum length measured along the lateral side.
- 59. The method of claim 39, wherein the providing of each implant includes providing each implant with a first maximum length measured along the medial side that is longer than a second maximum length measured along the lateral side.

Claims 60 and 61 (cancelled).

- 62. The method of claim 29, wherein the providing of the implant includes providing the implant with at least in part arcuate upper and lower surfaces extending from the lateral side to the medial side of the implant.
- 63. The method of claim 29, wherein the providing of the implant includes providing the implant with upper and lower surfaces each having an arcuate portion extending across the mid-longitudinal axis of the implant.
- 64. The method of claim 29, wherein the providing of the implant includes providing the implant with each of the upper and lower surfaces including at least one opening adapted to communicate with one of the adjacent vertebral bodies, the openings in the upper and lower surfaces being in communication with one another and adapted to permit for the growth of bone from adjacent vertebral body to adjacent vertebral body through the implant.
- 65. The method of claim 39, wherein each of the implants provided include upper and lower surfaces that are each arcuate along a vertical plane transverse to the mid-longitudinal axis of each respective implant.
- 66. The method of claim 39, wherein each of the implants provided include upper and lower surfaces that each include an arcuate portion extending from the lateral side to the medial side of each respective implant.
- 67. The method of claim 39, wherein each of the implants provided include upper and lower surfaces that have an arcuate portion extending across the mid-longitudinal axis of each respective implant.

68. The method of claim 39, wherein each of the implants provided include upper and lower surfaces that include at least one opening adapted to communicate with one of the adjacent vertebral bodies, the openings in the upper and lower surfaces being in communication with one another and adapted to permit for the growth of bone from adjacent vertebral body to adjacent vertebral body through each respective implant.